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manual of South African mammals is apparent. This, we are happy to say, is now being provided by Mr. Sclater in the form of a large octavo work in two volumes, beautifully printed and well illustrated with, for the most part, excellent text cuts, many of them prepared especially for the work. The region here included is that portion of Africa south of the Cunene and Zambesi rivers.

South Africa has a comparatively rich mammalian fauna, the three orders here treated—the Primates, Carnivora and Ungulata—numbering 95 species and 8 additional subspecies, while the remaining orders—the Chiroptera, Insectivora, Rodentia, Edentata and Cetacea—to be treated in Volume II., will doubtless raise the number to considerably more than 200. In the present work the author informs us he has endeavored 'to collect together all the information at present available on the subject of South African mammals,' but he has been hampered in its preparation by lack of specimens and by paucity of information regarding the life-history of the species. He has, however, laid a good foundation for further additions and given a most excellent and useful summary of the subject. A bibliography of the more important separate works relating to South African mammals occupies pp. xi–xix, and following the synonymy under each species is a paragraph, under the heading 'Literature,' giving further references.

The work is well designed to serve as a convenient manual, the higher groups being defined, and keys are provided to the genera and species, and the descriptions are fairly full. The text is further paragraphed under 'History,' 'Distribution,' 'Habits,' etc., where whatever is known of the species is briefly summarized.

In respect to nomenclature, it is well to note that the twelfth edition of Linnæus, instead of the tenth is taken as the starting point, and that specific names when employed for genera are discarded in their specific sense, so that we have, for example, *Suricata tetradactyla* instead of *Suricata suricatta*, although the latter is the older name; and *Oreotragus saltatrix* instead of *Oreotragus oreotragus*, etc. As usual with English authors, only two genera are recognized in the

family Otariidae, all the species but one being referred (p. 118) to the genus *Arctocephalus*, the type of which is wrongly given as *A. ursinus*; while the wholly undeterminable name *A. pusillus* (Schreber) is used for the single South African species, instead of the correct name *A. antarcticus* (Thunberg).

This volume is the second in point of issue—Volume I. of the late Dr. Stark's 'Birds of South Africa' being the first—of a 'series in which it is proposed to give an account of the Fauna of Africa south of the Zambesi and Cunéné Rivers,' under the general title 'The Fauna of South Africa,' under the editorship of Mr. W. L. Sclater, the author of the mammal volumes of the series. The second volume of the birds is in course of preparation by Mr. Sclater, from MSS. left by Dr. Stark, who was killed early in the present South African war.

J. A. A.

Report of the U. S. Commissioner of Fish and Fisheries for the Year ending June 30, 1900. By GEORGE M. BOWERS. Washington, Government Printing Office. 1900. Pp. 191.

The report of the Commissioner of Fish and Fisheries, for the year ending June 30, 1900, again shows an increase of fish distributed of a round hundred million, consisting chiefly of shad, cod, flatfish, whitefish and lake trout. Whitefish, shad and cod stand at the head of the list, the totals being about 337, 265, and 241 millions, respectively. The year, on the whole, has been a good one and the results commensurate with the steady expansion of operations, while local accidents of climate have, in a few cases, reduced the normal output. In California the drought of last year considerably affected the spawning migrations of the quinnat salmon. On the Rogue river, in Oregon, an innovation in the food of quinnat fry, in the way of using canned salmon scraps, was attempted with promising results. In Michigan, the close season was amended to allow the National Commission to take whitefish and lake trout for fish-cultural purposes, with the result of very large collections at a minimum expenditure. The Commission moreover operated the Michigan whitefish hatcheries at Detroit and Sault Ste., Marie, for which the State did not provide

this year. Most of the whitefish output was obtained from 'penned' fish, a method of holding the fish until ripe, which has now an assured place in fish-cultural operations. Seasonal difficulties affected unfavorably the pike-perch in Lake Erie and Vermont, though a total of 90 million eggs and fry was distributed.

The New England stations propagating the great marine food species were unusually successful. Cod were hatched in excess by 50 million of any previous record. The interesting experiment of tagging adult codfish for the purpose of acquiring data on their migrations and growth was continued, 1,311 being returned to the ocean in November from the Wood's Holl Station, of which 11 were captured, some as far south as New Jersey, before the close of the year. A new method was followed in flatfish culture, consisting in allowing natural spawning in tanks in place of fertilizing artificially, the results indicating the superiority of this means of obtaining fertilized eggs of this species.

Three new stations were put in commission—at Bullochville, Ga., Edenton, N. C., and Nashua, N. H., devoted chiefly to the salmonoids, shad and bass, making a total of 35 operated during the year.

The weather considerably shortened the shad season on the Potomac, but an unusual run occurred on the Delaware, the price falling to nearly nothing. The success here and on the Susquehanna made possible a large total output, a gain of several millions over the preceding year. The basses and crappie were in unusual demand, but the development of the collecting work on the Mississippi and Illinois rivers—by which fingerling bass that would otherwise be sacrificed are taken from the 'back' waters of the river, throwing the fish-cultural work upon nature—met all demands at a nominal expense.

Encouraging reports come from Montana and Colorado of the establishment of brook and steelhead trout in waters very recently without these valuable species. Captures of a few specimens in other cases indicate the process of establishing rainbow trout in Maine and Tennessee, Swiss trout in the Adirondacks, and quinnat salmon in Lake Ontario. The Chesapeake and Ohio canal was seined prior to drawing off the water for the winter, for a distance

of 92 miles, and some 90,000 fish of many species transferred to the Potomac.

Notable among the biological investigations of the Division of Scientific Inquiry are the oyster experiments at Lynnhaven Bay, Va. These are directed toward a practical method of fattening oysters by the use of a commercial fertilizer through the medium of their diatomaceous food, the diatoms appropriating the fertilizer. The experiments are made in an enclosed and tideless claire and have achieved a definite measure of success in demonstrating the possibility of fattening oysters to marketable condition by this means. The process is slower, however, than demanded for commercial purposes, and modifications of the conditions have been made which provide for artificial currents in the claire, thus approaching more nearly the conditions of nature.

The failure of the North Carolina oyster-beds has been taken up by the Commission, and the steamer *Fish-Hawk* spent the fall and winter on important portions of the grounds. A report upon the subject is in preparation. Eastern oysters have become well acclimatized in San Francisco Bay and support an industry yielding a half-million of dollars annually in mature oysters with the quantity and value on the increase. The conditions at Willapa Bay, Washington, were examined with reference to the fate of a plant of eastern oysters made there in 1894. It appears that the water is colder than is favorable for the setting of the spat. Nothing came of the plant, and while reports show that a large proportion of them were alive a year after planting, the original oysters have now almost entirely disappeared and there is a presumption of depredations upon these grounds. A method of obtaining spat from shallow ponds constructed for the purpose was recommended, the spat to be then planted in the bay. In connection with the failure of eastern oysters to multiply in the colder waters of our northwestern coast, oysters of northern Japan are to be transplanted to Washington waters.

The Wood's Holl laboratory has undergone expansion in equipment, the amount of work done, particularly in devoting, at the suggestion of the Commissioner, the museum room

to the purposes of the library. This change gave great satisfaction to the investigators, who were in greater number than usual. The work carried on included some chemical determinations of the connective tissue of the ocean sunfish, with a view to its value in making glue, and of lobster chitin in the hope of discovering for it a commercial use; diseases of fishes, anatomy of the star-fish, and of the alimentary tract of the flounder; photography and sketching of living marine forms. A series of publications has been planned which is to embrace all the invertebrate groups of the region. The Beaufort, N. C., laboratory completed the first year of its existence and concerned itself, among other things, with the breeding conditions of some fishes, sponges and parasitic crustaceans, the latter including a barnacle (*Dichalaspis*) on the gills of the common blue crab; spawning habits of certain food-fishes; life history of brittle stars; effects of abnormal conditions on the development of oyster eggs and those of other molluscs; the development of a common annelid (*Axiotaea*) which forms part of the food of bottom-feeding fishes, and the food of the hog-fish and croaker. An observation is made on the inferior flavor of the hog-fish taken at Beaufort, which reduces its value as a food-fish as compared with the same species taken, for instance, at Norfolk. One cause of the undesirable flavor is traced to the interesting form *Balanoglossus*. The Beaufort laboratory is happily located for the purposes of marine biology, and now that a permanent establishment has been authorized by Congress continuous systematic studies on broad lines may be anticipated.

In accordance with the direction of the last Congress, a special lobster and clam investigation, for the purpose of remedying the marked decline in these fisheries, has been instituted. With the lobster, efforts are directed toward methods of rearing the larvae through the early defenseless stages before liberating. With the clam it is apparently feasible to apply the methods of planting which are so extensively used with the oyster. The work has begun during the past summer and is proceeding satisfactorily.

Some work on variation in the common

mackerel, begun in 1898, with a view to the question of its separation into geographical races—a fact demonstrated by an English investigator, Mr. Walter Garstang, for British mackerel—was continued during the summer of 1899, and confirms Mr. Garstang's observation of a marked difference between American and British mackerel. As for recognizable American races the material examined, as far as it goes, tends to show that such do not exist. The data, however, from the extremes of the range of the species are not yet complete.

Collections of aquatic fauna and general biological observations have been carried on in Cobbseseecontee and Sebago Lakes in Maine, in Seneca Lake, New York, in Lake Mattamuskeet, N. C., in West Virginia, in the Wabash Basin, Indiana, and in California, Oregon and Arizona. The biological survey of Lake Erie was carried on as usual throughout the summer, with headquarters at Put-in Bay, plankton studies forming an important part of the work. The collections made by the *Fish-Hawk* expedition to Porto Rico in 1899 have been distributed to specialists in the various groups. The report on the fishes was issued during the last days of the year, the others are approaching completion and it is probable that all will be published during the next fiscal year.

Dr. H. F. Moore submits an outline of the recent extensive cruise of the steamer *Albatross* in the South Seas. This expedition left San Francisco in August, 1899, Mr. Alexander Agassiz in charge of the scientific work, assisted by a party of seven, four of whom represented the Commission. The *Albatross* cruised for over six months among the South Sea Islands, visiting the Marquesas, Paumotus, Society, Tonga, Fiji, Ellice, Gilbert, Marshall and Caroline Islands and Guam. Accounts of the voyage have appeared in these columns. In the Tonga group the trawl was used in 4,173 fathoms, the deepest trawl haul ever made. The work of the party concerned the zoology, geology, ethnology and botany of the island groups, the director devoting himself to the coral formations. The officers of the vessel made surveys and nautical observations. The *Albatross* reached Yokohama in March of the present

year and spent three months trawling and dredging on the coast of Japan. In June she sailed for Alaska on commercial investigations of the Alaska salmon fisheries.

The statistical canvasses have this year covered New England, New York and Lake Erie, and in May the canvass of the Pacific coast was begun. The figures for New England show a moderate falling off in value of fishery products since the last tabulation in 1889, and also in the amount of invested capital, the latter caused by the transfer of the menhaden industry to New York. The lobster fishery has the remarkable record of a diminution, since 1889, of over 50 per cent. in quantity and a coincident increase of over 50 per cent. in value. The total value of New England fisheries reaches over nine and one-half millions. Lake Erie and Lake Ontario come forward with a large increase in quantity and value, the whitefish, a species very extensively propagated by the Commission, sharing largely in this expansion. Over three and one-half million pounds of the much-abused carp were taken from the American waters of the lake in 1899, with a value of over \$50,000. Indeed, a glance at the figures for this species shows that the carp is certainly the most valuable fresh-water fish after the whitefish and its allies, the pike perch and the lake trout, and should afford food for thought to those who condemn the carp as an unmitigated evil. The Illinois Fisherman's Association reports the catch in the Illinois river as greater in quantity than that of all other species combined, with a value of nearly \$200,000. Carp have increased many fold in the Middle Atlantic States and the Middle West during the last decade, the quantity taken in Lake Erie, the Illinois river, and the Ohio river and its tributaries, during 1899, being nine times that of six years ago.

The annual visit to the fur-seal rookeries on the Pribilofs shows the continued decline of the seal herd as a consequence of the continuance of pelagic sealing. The number of seals taken from the islands under government supervision was 16,812, and the pelagic catch from the American herd some 34,000.

M. C. MARSH.

A Handbook of Photography in Colors. By THOMAS BOLAS, ALEXANDER H. K. TAL-
LENT and EDGAR SENIOR. Published by Marion and Co., London. American edition by E. & H. T. Anthony, New York and Chi-
cago.

The authors of this book have brought together in compact form the very scattered literature pertaining to color photography. Part I., by Mr. Bolas, contains a brief history of helichromy, from the early work of Seebeck, Herschel and others until the present day, covering about the same ground as the new edition of Zenker's '*Lehrbuch der Photochromie*.' His account of Wiener's work and suggestions regarding the possibility of getting a truly chromo-sensitive surface will be found of use by any who are engaged in the hitherto fruitless search of a substance which when exposed to colored light will assume permanently the color of the illuminating light. That such a surface is theoretically possible is clearly shown, and methods of realizing it in a crude way are given.

The general principles of the various processes are given, including those of Joly, Ives, Lippmann and others. Lippmann's account of his interference process as delivered in English before the Royal Photographic Society is given verbatim. His picture of the formation of the thin laminae which produce the colors by the stationary light waves is interesting. It will be remembered that these stationary waves are produced by backing the sensitive film with mercury. "If you put no mercury," says Lippmann, "each train of waves rushes through the plate and wipes off every record of its own form by reason of its velocity; you cannot expect a thing which moves with a velocity of 300,000 kilometers a second to give a photograph of itself. If you put a mercury mirror behind the plate, then the following phenomena occur: the light is reflected back on itself; the light rushes in with the velocity of light, and rushes out with the same velocity; the entering and issuing waves interfere, and the effect of interference is that vibration takes place, but the effects of propagation are stopped, and instead of having propagated waves, we get stationary waves; that is, the waves